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Gadolinium and Renal Failure Guidelines

The FDA has issued information for healthcare professionals regarding the use of gadolinium contrast agents in magnetic resonance imaging scans. There have been multiple reports of patients who develop nephrogenic systemic fibrosis/nephrogenic fibrosing dermopathy (NSF/NFD) after receiving gadolinium-based contrast agents for magnetic resonance imaging and angiography. All of these initial cases have had evidence for pre-existing renal failure (moderate, GFR <60 mL/min/1.73m²) to end-stage renal disease (GFR <15mL/min/1.73m²). They have recommended that physicians should carefully assess the need for gadolinium-based contrast agents in patients with moderate to end-stage renal disease when performing MRI and MRA.

NSF/NFD was first described in 1997 and is characterized by skin thickening with inhibition of flexion and extension of joints due to contractures. Patients may develop wide spread fibrosis of other organs. The disease is progressive and may be fatal.

The initial cases reported occurred with Omniscan (Amersham). However, the FDA has recommended caution administering of OptiMARK, Magnevist, ProHance and MultiHance. In those patients with severe renal failure (defined as GFR <15mL/min/1.73m²), it has been suggested that hemodialysis be instituted promptly after receiving the contrast agent for MRI. This has been interpreted by some as meaning as early as two to three hours following contrast injection.

Recommendations

Our current MRI screening form contains a question about the presence of kidney (renal) disease. If this is checked positive (indicating yes, the patient has a history of kidney disease), the technologist must notify the radiologist before the MRI scan is initiated. The radiologist will determine if the MRI scan should be performed and if performed, if the scan should be with or without contrast agents. In all patients with any history of renal disease, the use of gadolinium compounds should be minimized. Specifically, the use of Omniscan must be avoided.

In patients with known renal disease, it is important to assess the degree of renal disease, if possible. If a recent (within 30 days) serum creatinine level is available, GFR can be estimated at www.globalrph.com/cgi-bin/crcl.cgi, www.nephron.com. If no creatinine is available, the use of gadolinium contrast should be used only in emergency cases and where it is deemed essential to the emergency diagnostic question. In cases with creatinine clearance of <15 (severe renal failure), all efforts to eliminate contrast should be made. If it is necessary to give gadolinium, hemodialysis must be arranged to occur promptly following the exam. The dose should be limited to <0.1 mM/kg (No "high" dose gadolinium administration is allowed in any case of severe renal failure). If the creatinine clearance is >15 but <60 (moderate renal failure,

Class IV) efforts should be made to minimize the utilization of gadolinium, and gadolinium may only be used following consultation with the patient's primary physician.

In patients with the normal renal function, and/or patients with no known history of renal failure, it is recommended that all patients receiving gadolinium contrast agents voluntarily hydrate themselves after the study. Although there is no evidence of NSF/NFD in patients with normal renal function, it is always wise to consider the necessity for contrast in protocoling MRI patients.

Specific Recommendations

- **Minimize use of gadolinium contrast agents in all patients**
- **Check creatinine and calculate GFR in all patients with history of renal disease and need for gadolinium contrast. If no creatinine is available, use gadolinium only in an emergency**
 - **Creatinine Clearance = $(140 - \text{Age})(\text{kg}) / (72 \times \text{Creatinine})$ [multiply by 0.85 if female]**
- **Patients with severe renal failure (creatinine clearance < 15)**
 - Eliminate use of gadolinium contrast if possible
 - Limit dose to < 0.1 mM/kg (no "high dose")
 - Do not use Omniscan
 - If gadolinium is used, prompt hemodialysis must be arranged for
- **Patients with moderate renal failure (creatinine clearance > 15 but < 60)**
 - Minimize use of gadolinium
 - If absolutely necessary minimize dose
 - Consult with patient's physician

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